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Quality Metrics of an Integrated E-Learning System – students' perspective

Ksenija Klasnić*, Jadranka Lasić-Lazić** and Sanja Seljan**
University of Zagreb - Faculty of Humanities and Social Sciences
**Department of Sociology, **Department of Information Sciences*
I. Lucica 3, 10 000 Zagreb, Croatia
kklasnic@ffzg.hr; jlazic@ffzg.hr; sseljan@ffzg.hr

1. Introduction

As e-learning has become an increasingly important issue in educational systems in the last several years, a considerable number of generic standards, quality guidelines and frameworks have been published relating to better efficiency and quality improvement of the e-learning. While early initiatives were concentrated on the functional understanding and technical skills of ICT use, nowadays they take more into consideration motivation, satisfaction and contextualization which are reflected in the quality of e-learning. In the paper, different views towards the quality of an integrated e-learning have been presented, and the research regarding the quality of the integrated e-learning system (Moodle) introduced by prof. J. Lasić-Lazić and translated into Croatian version (Omega) at the Faculty of Humanities and Social Sciences, University of Zagreb in relation to different European policies.

2. Reference work

Today e-learning systems take important place in formal and less formal educational setting. The first generation of e-learning systems often missed social context and had lack of credibility [1], with exaggerated expectations. Therefore, a number of guidelines, recommendations and surveys aimed to elaborate on quality of e-learning systems. As in Stephenson[2], the quality is easier to describe, than to define, including great number of indicators ranging from purpose, clarity, relevance, technical skills, ease of implementation and consequences up to notions of context, ethics, then cost effectiveness, etc.

[1] Quality Assurance and Accreditation For European eLearning: the Case For a European Quality Mark Initiative, EFQUEL Green Paper No. 41 *Brussels, 03/ 2007.* http://www.qualityfoundation.org/index.php?m1=2&m2=25&view=0

[2] Stephenson, J. Definitions of indicator of quality on the application of ICT to University Teaching. Tarragona, 2005.

According to the standard ISO/IEC 19796-1[3] designed for learning, education and training one of the first steps in order to harmonize different approaches in e-learning was to develop the new quality standard which should be used in order to define the context in which the system will be used. As stated in the document, this document serves as a reference framework offering orientation to aspects that should be covered and possible solutions supporting adaptation to the specific requirements of the organization. It includes process description (e.g. evaluation of didactic methods) taking into consideration need analysis, framework analysis (of context, resources, organizational context), educational process, production, implementation, realization and evaluation, methods (e.g. identification, alternatives, priorities), objectives (e.g. adequate selection of one or more didactic concepts), target group (taking into consideration their competencies and learning styles), organization, relations, etc.

The European Parliament and the Council have established multiannual program4 for the effective integration of information and communication technologies (ICT) in education and training systems in Europe (eLearning Programme). This program aims to improve the quality of education and adaptation to the needs of the society in the lifelong learning context. The specific objectives include, among others, promotion of digital literacy, social cohesion, and personal development, enhancing intercultural dialogue and European dimension in education and exploitation of the e-learning through innovative teaching methods with the aim to improve the learning quality and to enforce the learner's autonomy. The aim of the European Survey conducted in 2005 among 600 students5 was to assess the state-of-the-art of the e-learning from the point of view of the main stakeholders: teachers, trainers and learners analyzing four main questions: who are respondents; what is e-learning; how is e-learning rated; what is future of e-learning (last three questions are analyzed through teachers', trainers' and learners' points of views). The survey indicates that e-learning is not seen as isolated, but perceived very positively, as needed and integrated into everyday educational scenario. Attention in this research is given to pedagogical aspect, competence development exceeding technical skills, but stressing critical thinking, learning skill and self-study.

Evaluation of four online courses at the Centre for Research on Learning at Indiana University (Graham, 2000)6 was conducted with the aim to provide feedback regarding active learning, encouraging student-faculty contact and respecting diverse talents and ways

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[3] Pawlowski, J.M. (2006): ISO/IEC 19796-1: How to Use the New Quality Framework for Learning, Education, and Training. White Paper, Essen, Germany, 2006.

[4] Decision No 2318/2003/EC of the European Parliament and of the Council adopting a multiannual programme (2004 to 2006) for the effective integration of information and communication technologies (ICT) in education and training systems in Europe (*e*Learning Programme). 5. 12. 2003.

5 Aimard, V.; Mc Cullough, C. E-Learning in Europe: How do trainers, teachers and learners rate e-learning? Cedefop, 2006. http://cms.eun.org/shared/data/pdf/report_survey_teachers_and_learners_and_e-learning_final.pdf

6 Graham, C., Cagiltay, B., Craner, J., J. Lim, Duffy, T.M. (2000) Teaching in a Web Based Distance Learning Environment: An Evaluation Summary Based on Four Courses. CILT, Indiana University. http://crlt.indiana.edu/publications/crlt00-13.pdf

of learning. Areas where improvements were mostly needed were students' cooperation, instructor's feedback and interface design. The main problems were inadequate instructors' knowledge on teaching strategies in online environment, great differences regarding asynchronous conferencing, considerable time for instruction managing and limited access to the resources.

"The Five Pillars of Quality Online Education" by Lorenzo and Moore7 include learning effectiveness, student satisfaction, faculty satisfaction, cost effectiveness and access. Quality metrics could be related to the operational level emphasizing ICT practice within traditional teaching program, as in Grahan et al. 8 including student-faculty contact, student cooperation, active learning, prompt feedback, time on task, high expectations, and diverse ways of learning. As in Stephenson (2005), other indicators include online forums for problem discussion. At pedagogical level quality aspects include pedagogical and psychological approaches, epistemology, goal orientation, teacher's role, motivation, program flexibility, learners' control, user activities, cooperative learning, etc. In longer term dimensions, the indicator of return on investment is of the considerable concern at universities which could be measured through reactions at the end of the course, change of learning attitudes, knowledge and skill improvement, change of behaviour, and results of changes in key business. In the learner-centered teaching process, one of the main tasks is learner's responsibility finding the best possible ways to manage their own learning.

3. Integrated e-learning system

The ambition to implement educational reforms in line with educational national policy statements, European standards and guidelines, Bologna declaration and other reference works of the educational paradigm, have resulted by the introduction of the integrated e-learning system and its quality measurement.

Organized into 23 Departments with 111 chairs, offering 10 major and 33 double major undergraduate programs, and a number of postgraduate programs, for more than 6,500 students of whom the majority study at two departments, a constant problem of time and space for lectures and tutorials is present. The Faculty of Humanities and Social Sciences functions almost as a small university and besides organizational and infrastructural constraints, the need for the introduction of an integrated e-learning environment was perceived as a prerequisite for the achievement of future educational reforms.

In 2002, a three year project Organization of Information and Knowledge in the Electronic Learning Environment http://infoz.ffzg.hr/oizeoo) managed by prof. Jadranka Lasić-Lazić has started, funded by the Croatian Ministry of Science with the aim to investigate, test and

7 Lorenzo, G., Moore J.C., (2002) Report to the Nation: Five Pillars of Quality Online Education, The Sloan Consortium, Needham, MA http://www.sloan-c.org/

8 Graham, C., Cagiltay, J. Lim, B., Craner, J., & Duffy, T.M. (2001) Seven Principles of Effective Teaching: A Practical Lens for Evaluating Online Courses. Michigan Virtual University.
http://www.tcc.edu/welcome/collegeadmin/OIE/SOA/review/toolkit/documents/Article_Seven_Principles_of_Effective_Teaching_A_Practical_Lens_for_Evaluating_Online_Course.pdf

evaluate open source (Learnloop, ZOPE, MOODLE…) and commercial solutions (WebCT, Blackboard…) and decide upon the best solution for the needs of the teaching staff of the Department of Information Sciences and in future the Faculty. The fact that Moodle is a free, easy-to-use system (i.e. everyone with basic computer literacy can easily use it) with simple and understandable interface was the main reason for the implementation. Therefore, Moodle interface was translated, customized and implemented for the academic year 2004/2005 under the name OMEGA.
At the moment Omega has been used by more than 3.800 students, more than 200 lecturers, offering more than 400 online courses with around 60GB materials. As Omega e-learning system is used by a considerable number of teachers and students, it is important to determine the degree of Omega's implementation in the educational system of Faculty and also the quality of this implementation.
One of the indicators of efficacy and quality of the implementation and integration of e-learning systems into the educational system is taken to be students' satisfaction with the system and its use. Therefore, a survey was conducted at the Faculty of Humanities and Social Sciences to determine students' attitudes and satisfaction with the use of Omega. Students' attitudes have been defined as the dependent variable.

4. Research

As the number of student and teacher enrollments to the e-learning system is constantly growing and having in mind the need for **complementary teaching tools** unifying traditional teaching methods and ICT, as well as official recommendations, standards, guidelines and frameworks, the research was conducted on quota convenience sample of 148 students at the Faculty of Humanities and Social Sciences, University of Zagreb. As presented in reference works, in a number of surveys a range of different approaches has been implemented taking into account functional understanding, pedagogical approach, practical and social aspects, personal attitudes, context, quantity, quality, etc. Therefore, this research took into consideration four main issues:
1) attitudes regarding the need for better integration of the e-learning into traditional teaching,
2) attitudes regarding better educational quality through the use of e-learning,
3) attitudes regarding quantity and
4) the quality of the e-learning usage.
These four main issues were defined as our main latent dependent variables and were measured by a great number of manifest variables. Independent context was defined with several concepts which are relevant for understanding the complexity of diverse attitudes towards the use of e-learning in educational system.
In this the focus is on description of students' attitudes towards the use of Omega e-learning system in the context of four mentioned dependent variables, also including description of several independent concepts such as students' self-evaluation of own computer competence and satisfaction with this competence, the frequency of computer use in educational and private purposes, evaluation of their teachers' computer competence, frequency of use of ICT by their teachers, satisfaction with Omega's options and general attitudes towards Omega. Mutual relationships between mentioned concepts will be

analyzed, and also the relationships between these concepts and some students' socio-demographic characteristics.

5. Methodology and sample

The study was conducted in May 2007. The constructed questionnaire consisted out of 106 variables covering the relevant aspects for analyzing the subject of attitudes towards e-learning and was applied on quota convenience sample of 148 students. There were 74% female and 26% male examinees (which approximately correspond with the Faculty gender structure), all years of study were equally represented in the sample and the greatest numbers of students were from Department of English (34%), Department of Sociology (29%) and Department of Information Sciences (20%).
All analyses were conducted using Statistical Package for Social Sciences, statistical software version 13 (SPSS, Chicago IL).

6. Results

6.1. Independent concepts – description and some mutual relationships

Before presenting the main issues of this paper – four aspects regarding students' attitudes towards the use of Omega e-learning system – firstly, description of some of the variables follow, that by our opinion, constitute an independent context for explanation of diverse attitudes towards the use of e-learning in educational system.

6.1.1. Computer competence and satisfaction with own computer competence – students' self-evaluation

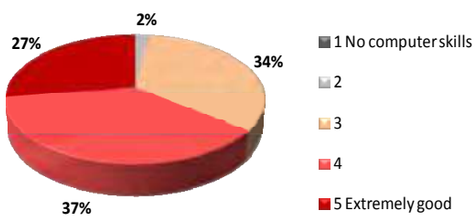

Fig. 1. Self-evaluation of own computer competence (N=146)

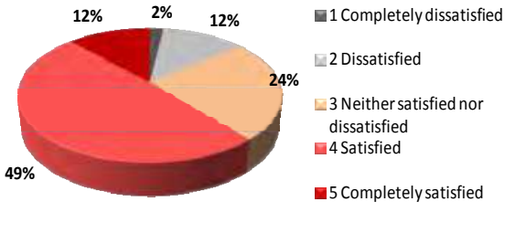

Fig. 2. Satisfaction with own computer competence (N=148z)

Figure 1. shows results of students' self-evaluation of their own computer competence on five-point ordinal scale with ordered response levels from (1) *No computer skill* to (5) *Extremely good computer skills.* Average score was 3.9 (sd=.828), and mod (value that occurs the most frequently) was 4. There was no answer "No computer skills", and only 2% of those with very weak computer skills. Obviously, our students consider themselves to have rather high level of computer competence. Figure 2. shows students' satisfaction with their computer competence on five-point ordinal scale with ordered response levels from (1) *Completely dissatisfied to* (5) *Completely satisfied.* Average score was 3.6 (sd=.926), and mod was 4.
After recoding both variables into three-point ordinal scale the following relation between computer competence and satisfaction with this competence could be noticed (Table 1.):

Satisfaction with own computer competence	Computer competence						Total	
	low		medium		high			
	n	%	n	%	n	%	n	%
low	3	100.0%	14	28.6%	3	3.2%	20	13.7%
medium	0	0.0%	24	49.0%	12	12.8%	36	24.7%
high	0	0.0%	11	22.4%	79	84.0%	90	61.6%
total	3	100.0%	49	100.0 %	94	100.0%	146	100.0%

Table 1. Students' computer competence and satisfaction with this competence

As expected, students with low computer competence are dissatisfied, most students who have medium computer competence have also medium satisfaction, and the majority of students with high computer competence have also a high level of satisfaction (Pearson's chi-square analysis: χ^2 =71.396; df=4; p<.001). Interesting is that some students who evaluate their computer competence as high, are not satisfied with it. This is probably so because they have higher aspirations than other students: they already have good computer skills, but they are not satisfied because they would like to be even better.

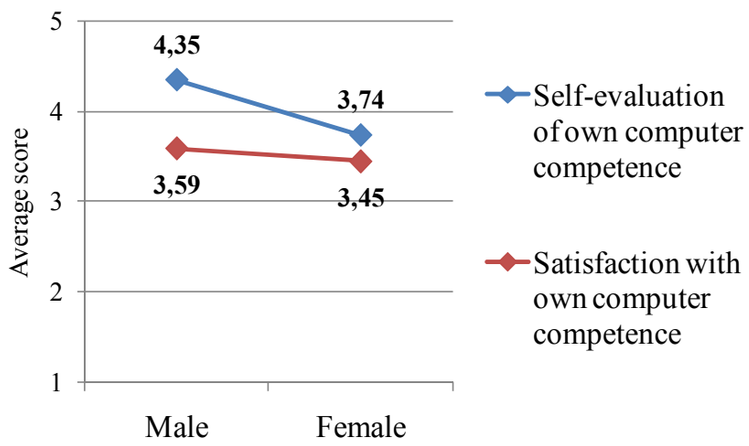

Fig. 3. Average scores of students' computer competence (N=146) and satisfaction with this competence (N=148) by gender Mann-Whitney U test showed a statistically significant difference between male and female students in both variables: male students are evaluating their computer competence higher than female (p<.001) and they are also more satisfied with their own computer competence (p=.001).

6.1.2. Computer use

Figures 3. and 4. show estimates of frequency of computer use in general and in educational purposes on five-point ordinal scale with ordered response levels from (1) Never to (5) Every day. As presented, over 80% of students use computer daily, and over 40% uses computer daily in educational purposes. Average scores for general and educational purposes were 4.78 (sd=.474) and 4.25 (sd=.727) respectively. It should be noticed that all

students use computer in educational purposes, and that only one percent does that very rarely (few times a year).

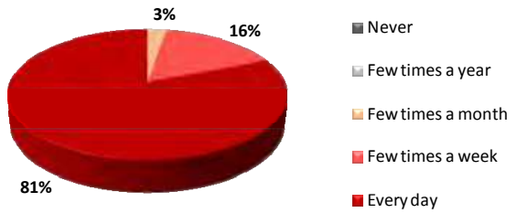

Fig. 4. Frequency of computer use (any purpose) (N=148)

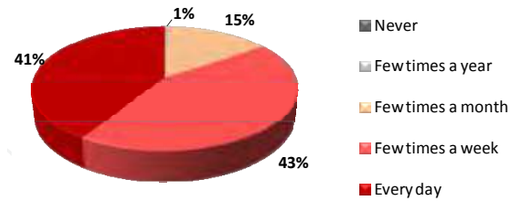

Fig. 5. Frequency of computer use in educational purposes (N=148)

6.1.3. Students' evaluation of their teachers' computer competences

Students also evaluated their teachers' computer competences on the same five-point ordinal scale with ordered response levels from (1) No computer skill to (5) Extremely good computer skills. They have done two evaluations: one for all teachers on their faculty (that is, teachers they have had an opportunity to meet and listen to their courses) and the other evaluation only for those teachers whose courses are enrolled to Omega.

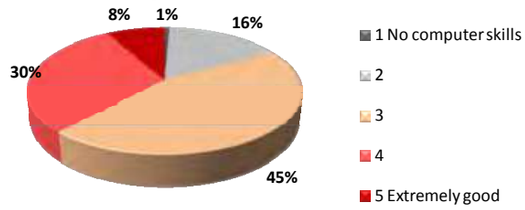

Fig. 6. Evaluation of computer competences – all teachers (N=147)

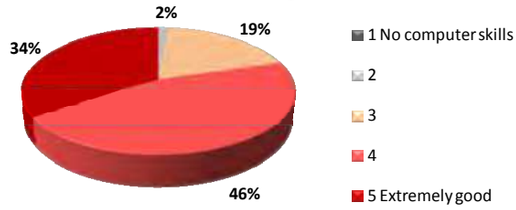

Fig. 7. Evaluation of computer competences – teachers who have courses on Omega (N=132)

When evaluating computer competences of all teachers on the faculty, value that occurs the most frequently is 3 (almost 45% of students gave them grade 3) and when evaluating computer competences of teachers who have courses on Omega, value that occurs the most frequently is 4 (over 45% of students gave them grade 4). Wilcoxon signed-rank test showed that teachers who have courses on Omega are graded statistically higher ($p<.001$).

6.1.4. Frequency of ICT use by teachers

Students estimated the frequency of ICT use by their teachers on an ordinal five-point scale with response levels (1) Never, (2) Rarely, (3) From time to time, (4) Often and (5) Very often. They were given five indicators for evaluation: video projections (PowerPoint presentations, etc.) during lectures, communication with teachers via e-mail, recommendations of exam or seminar materials available on the Internet, the use of Internet for disclosure of information regarding exam results, lecture changes, time of consultations, and uploads of lecture materials on the Internet (see Table 2.).

	(1)	(2)	(3)	(4)	(5)	$\bar{X}$	N
1. Video projections (PowerPoint presentations, etc.) during lectures.	2.7%	12.9%	38.8%	28.6%	17.0%	3.44	147
2. Communication via e-mail.	1.4%	10.8%	36.5%	41.9%	9.5%	3.47	148
3. Recommending exam or seminar materials available on the Internet.	8.9%	28.1%	37.0%	19.9%	6.2%	2.86	146
4. Using Internet for disclosure of information regarding exam results, lecture changes, time of consultations, etc.	0.0%	7.4%	25.0%	40.5%	27.0%	3.87	148
5. Uploading lecture material on the Internet.	2.7%	21.8%	32.7%	25.2%	17.7%	3.33	147

Table 2. Frequency of ICT use by teachers (distributions of percentages, means and numbers of valid answers)

According to our students, the most commonly used information-communication technology by teachers is the use of Internet for disclosure of information regarding exam results, lecture changes, time of consultations, etc. – over 67% of students estimated that their teacher use the Internet for such purposes often or very often. It is followed by communication via e-mail and video projections (PowerPoint presentations, etc) during lectures. The thing that teachers use the least often is literature for seminars or exams available on the Internet.

	Teachers' computer competence	
	rho	p
1. Video projections (PowerPoint presentations, etc.) during lectures.	.269*	.001
2. Communication via e-mail.	.277*	.001
3. Recommending exam or seminar materials available on the Internet.	.360*	<.001
4. Using Internet for disclosure of information regarding exam results, lecture changes, time of consultations, etc.	.299*	<.001
5. Uploading lecture material on the Internet.	.379*	<.001

Table 3. Spearman's correlation: ICT use by teachers and their computer competence
* Correlation is significant at the 0.01 level (2-tailed).

There are positive correlations of teachers' computer competences with all indicators of frequency of ICT use. In other words, students evaluate that those teachers who have higher degree of computer competence more frequently use ICT in their work and communication with their students.

6.1.5. General attitudes towards Omega

For measuring students' general attitudes towards Omega we used five-point Likert scale with ordered response levels (1) Strongly disagree, (2) Disagree, (3) Neither agree nor disagree, (4) Agree and (5) Strongly agree. The scale was constructed out of 14 items[9] presented in Table 4.

Some statements were formulated expressing positive, and some negative attitudes towards Omega.

	(1)	(2)	(3)	(4)	(5)	$\bar{X}$	N
1. Omega is unnecessary addition to the university education.	65.3%	25.2%	6.1%	2.7%	0.7%	1.48	147
2. Omega facilitates distribution of lecture material.	0.7%	1.4%	12.2%	43.5%	42.2%	4.25	147
3. Omega is just an additional burden for students.	38.8%	36.7%	15.0%	8.2%	1.4%	1.97	147
4. It would be better if teachers would personally hand out lecture material instead of putting it on Omega.	27.4%	32.9%	25.3%	11.6%	2.7%	2.29	146
5. Omega should be used only by students from the Department of information sciences.	67.3%	22.4%	6.8%	0.7%	2.7%	1.49	147
6. Omega makes learning easier.	0.7%	3.4%	26.0%	47.3%	22.6%	3.88	146
7. Omega is a helpful addition to the university education.	0.0%	0.7%	11.6%	47.6%	40.1%	4.27	147
8. Omega usage for specific courses raises the quality of lectures.	1.4%	5.4%	31.3%	33.3%	28.6%	3.82	147
9. Omega usage requires too much computer skills.	28.1%	54.8%	11.0%	4.8%	1.4%	1.97	146
10. It would be better if all teachers would use Omega.	0.0%	6.3%	28.5%	34.0%	31.3%	3.90	144
11. Omega usage is a positive step towards higher information literacy amongst students.	0.7%	0.7%	22.1%	42.1%	34.5%	4.09	145
12. Omega usage is too difficult.	36.3%	48.6%	11.6%	2.1%	1.4%	1.84	146
13. Omega is practical because it allows completing some of the obligations without being	2.0%	5.4%	14.9%	44.6%	33.1%	4.01	148

[9] Before the construction of Likert scale, items number 1, 3, 4, 5, 9, 12 and 16 were recoded.

present at the university.							
14. It's more difficult to pass an exam for a course which is on Omega because then professors have higher expectations.	15.5%	37.8%	41.2%	4.7%	0.7%	2.37	148

Table 4. General attitudes towards Omega (distributions of percentages, means and numbers of valid answers)

The majority of students agree with the following statements: "Omega is a helpful addition to the university education." (87.7%10), "Omega facilitates distribution of lecture material." (85.7%), "Omega is practical because it allows completing some of the obligations without being present at the university." (77.7%) and "Omega usage is a positive step towards higher information literacy amongst students." (76.6%). It should be noticed that all of these statements express positive attitudes towards Omega.

Statements that have the largest percentages of disagreement are the following: "Omega is unnecessary addition to the university education." (90.8%11), "Omega should be used only by students from the Department of information sciences." (89.7%), "Omega usage is too difficult." (84.9%), "Omega usage requires too much computer skills." (82.9%) and "Omega is just an additional burden for students." (82.9%). Notice that all of these statements express negative attitudes towards Omega.

Based on these distributions we may conclude that the majority of students have positive attitudes towards Omega, considering it to be a useful contribution to the university education that facilitates distribution of lecture materials and increases the degree of information literacy. It is also considered to be practical because it allows completing some of the obligations without being present at the university. Moreover, the majority of students do not consider Omega usage to be too demanding, neither in general nor in the context of computer usage knowledge. The majority of students also don't think that Omega should be used only by students from the Department of Information Sciences which is a very important finding because it indicates a fact that the students are aware that technology, and information technology especially, has become an everyday requirement for experts of all professional orientations.

It is interesting to mention that there are some statements that a great number of students can neither agree nor disagree: "It's more difficult to pass an exam for a course which is on Omega because then professors have higher expectations" (41.2%), "It would be better if all teachers would use Omega." (28.5%), "Omega makes learning easier." (26.0%) and "It would be better if teachers would personally hand out lecture material instead of putting it on Omega." (25.3%).

To test the internal consistency reliability of this scale, Cronbach's alpha was computed and found to be .901, indicating very high reliability for this 14 items. The constructed scale was

10 The given percentages are sums of response levels (4) *Agree* and (5) *Strongly agree.*

11 The given percentages are sums of response levels (1) *Strongly disagree* and (2) *Disagree.*

also tested for normality using the nonparametric one sample Kolmogorov-Smirnov test which showed that the scale is distributed according to normal distribution (p=.347).

General Attitudes Towards Omega in Relation to Computer Use and Competence

To test the hypothesis about the difference in averages on general attitudes towards Omega according to level of students' computer competence and frequency of computer use, we performed one-way analyses of variance and Scheffe post hoc tests for homogeneous variances.

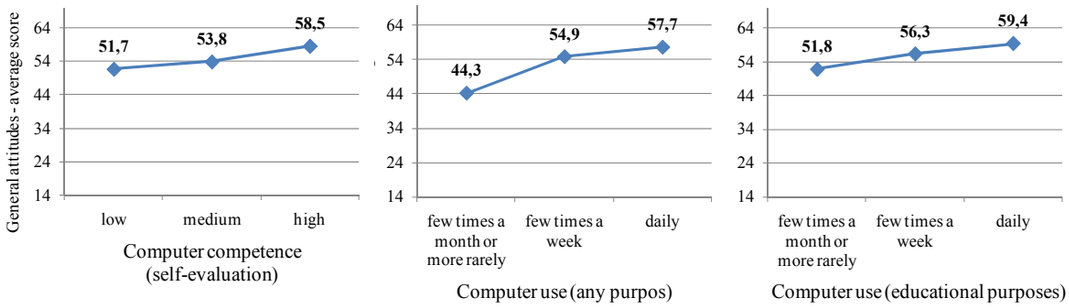

Fig. 8. Average scores on general attitudes towards Omega

The analyses showed statistically significant difference in means between students with medium and the ones with high computer competence (F=6.298, df=2, p=.002): students with high computer competence have more positive general attitudes towards Omega. There is also a statistically significant difference in means between students who use computer in any purpose daily and all other students (F=6.885, df=2, p=.001): students who use computer daily have more positive general attitudes towards Omega. Similarly, there is a statistically significant difference in means between students who use computer in educational purposes daily and the ones who use it only few times a month (F=6.125, df=2, p<.001).

6.1.6. Satisfaction with Omega's options and characteristics

For measuring students' satisfaction with Omega's options and characteristics five-point Likert scale was used with ordered response levels (1) Completely dissatisfied, (2) Dissatisfied, (3) Neither satisfied nor dissatisfied, (4) Satisfied and (5) Completely satisfied. The instrument has been applied only to those students who took at least one course enrolled to Omega. Six different attributes were given for evaluation: visual interface, content organization, possibilities of student-student and student-teacher communication via Omega, amount of lecture material and data access and update.

	(1)	(2)	(3)	(4)	(5)	$\bar{X}$	N
1. Visual interface.	3.8%	13.6%	24.2%	53.8%	4.5%	3.42	132
2. Content organization.	0.8%	12.1%	14.4%	62.9%	9.8%	3.69	132
3. Possibility of intercommunication between	1.5%	12.9%	35.6%	44.7%	5.3%	3.39	132

students.							
4. Possibility of intercommunication between students and teachers.	1.5%	10.6%	34.1%	47.0%	6.8%	3.47	132
5. Amount of lecture material.	2.3%	22.1%	25.2%	40.5%	9.9%	3.34	131
6. Data access and update.	2.3%	18.2%	25.0%	47.7%	6.8%	3.39	132

Table 5. Satisfaction with Omega's options and characteristics (distributions of percentages, means and numbers of valid answers)

All distributions are mildly right asymmetric which means that students tend to be satisfied with Omega's options and characteristics given for evaluation (average scores range from 3.34 for amount of lecture material to 3.69 for content organization).
To test the internal consistency reliability of this scale, Cronbach's alpha was computed and found to be .768, indicating relatively high reliability for this six items. The constructed scale was also tested for normality using the nonparametric one sample Kolmogorov-Smirnov test which showed that the scale is distributed according to normal distribution (p=.167).

Satisfaction With Omega's Options in Relation to Computer Use and Competence

To test the hypothesis about the difference in averages on satisfaction with Omega's options according to level of students' computer competence and frequency of computer use (generally and in educational purposes), we performed one-way analyses of variance. The analyses didn't show any statistically significant differences, so we can conclude that students do not differ in satisfaction with Omega's options on the basis of the variables mentioned above.

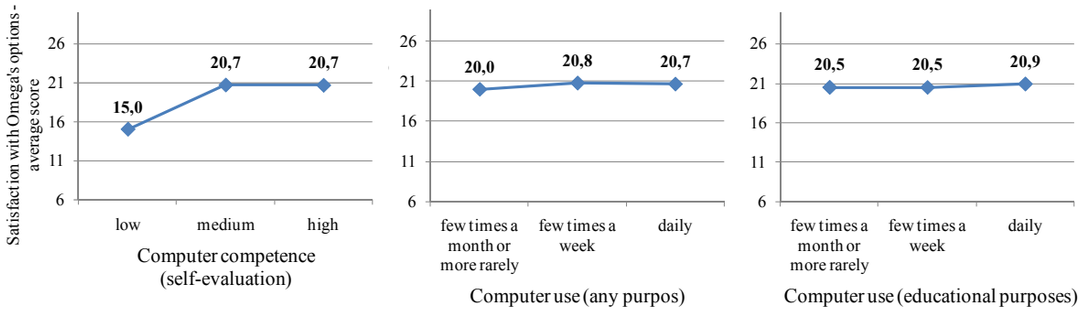

Fig. 9. Average scores on satisfaction with Omega's options and characteristics

6.1.7. Motivation for studying

Motivation for studying was measured with 17 statements covering several groups of possible motives for students to enter and continue their studying on the university such as their own desire for knowledge, their parents' persuasion, their friends who are also students, insurance of a better future etc. Each statement was evaluated on five-point ordinal scale with response levels (1) It doesn't refer to me at all, (2) It doesn't refer to me, (3) I don't know, I'm not sure, (4) It refers to me and (5) It refers to me completely.

	(1)	(2)	(3)	(4)	(5)	$\bar{X}$	N
1. I wouldn't want to quit the university because I wouldn't want to disappoint my parents.	28.4%	16.2%	13.5%	32.4%	9.5%	2.78	148
2. I prefer to study in groups, not by myself.	37.2%	23.0%	17.6%	16.9%	5.4%	2.30	148
3. I like completing my obligations on time so I would have more time for personal amusement.	6.8%	23.0%	20.3%	27.7%	22.3%	3.36	148
4. I like to learn new things and acquire new skills.	0.0%	1.4%	9.5%	46.6%	42.6%	4.30	148
5. I always knew that I want to enroll on the university.	1.4%	2.0%	8.8%	17.7%	70.1%	4.53	147
6. I extremely value my parent's and my family's opinion regarding my progress at the university.	8.8%	16.9%	20.9%	35.1%	18.2%	3.37	148
7. It would really bother me if I had lower grades then my colleagues.	14.2%	23.0%	23.0%	31.1%	8.8%	2.97	148
8. I enrolled on the university because my parents persuaded me to it.	72.3%	16.9%	6.8%	2.7%	1.4%	1.44	148
9. It's very important for me to keep my student's rights.	4.1%	6.8%	21.2%	32.2%	35.6%	3.88	146
10. Passing the exams is my only concern. Grades don't bother me at all.	14.3%	35.4%	21.1%	23.1%	6.1%	2.71	147
11. Most of my friends are students as well.	3.4%	5.4%	14.3%	38.1%	38.8%	4.03	147
12. It's important for me to finish university because it assures me financially more stable future.	3.4%	2.0%	14.2%	41.9%	38.5%	4.10	148
13. I believe that time being a student is the best and the most entertaining time in our lives.	6.8%	4.7%	17.6%	31.8%	39.2%	3.92	148
14. My friends would be very disappointed if I would quit the university.	18.9%	14.9%	29.1%	26.4%	10.8%	2.95	148
15. I'm studying because I think it will provide a better	0.7%	1.4%	9.5%	39.2%	49.3%	4.35	148

future for me.							
16. I think that people who enroll on the university after high school have few more years for „enjoying life“.	20.3%	9.5%	23.6%	31.1%	15.5%	3.12	148
17. I tend to pass all my exams in a given period of time because I financially couldn't handle to renrol the academic year.	10.1%	15.5%	24.3%	21.6%	28.4%	3.43	148

Table 6. Satisfaction with Omega's options and characteristics (distributions of percentages, means and numbers of valid answers)

The following statements refer to the majority of students: "I like to learn new things and acquire new skills." (89.2%12), „I'm studying because I think it will provide a better future for me. (88.5%)", "I always knew that I want to enroll on the university." (87.8%), "It's important for me to finish university because it assures me financially more stable future." (80.4%) and "Most of my friends are students as well." (76.9%).
The statements that don't refer to the majority of students are: "I enrolled on the university because my parents persuaded me to it." (89.2%13), „I prefer to study in groups, not by myself." (60.2%), „I wouldn't want to quit the university because I wouldn't want to disappoint my parents." (44.6%) and „Passing the exams is my only concern. Grades don't bother me at all." (49.7%).
We can conclude that the majority of our students enrolled on university because they always wanted to do so, and they didn't do it on anyone's persuasion. One of the main motives for studying and successful study completion is the insurance of better and financially more secure future, but also students' own desire for acquisition of new knowledge. One could say that personal motivation for studying and successful study completion has showed to be a specific combination of extrinsic (better and financially more secure future) and intrinsic (desire for studying and acquisition of new knowledge) motivation factors.
These responses were factor analyzed to determine whether underlying factors might be found that could summarize the results on students' motivation for studying. Items number 1, 6 and 11 were excluded from the analysis because they didn't fulfill Thurstone's principle of simple structure. Extraction method was principal component analysis and rotation method varimax with Keiser normalization. The final varimax solution extracted 6 statistically significant components explaining 65.23% of total variance. The results are presented in Table 7. Only loadings equal or greater than 0.1 are shown.

12 The given percentages are sums of response levels (4) It refers to me and (5) It refers to me completely.
13 The given percentages are sums of response levels (1) It doesn't refer to me at all and (2) It doesn't refer to me.

	Component					
	1	2	3	4	5	6
5. I always knew that I want to enroll on the university.	.858					
8. I enrolled on the university because my parents persuaded me to it.	-.822		.113			-.146
4. I like to learn new things and acquire new skills.	.549		.325	.232	-.119	-.116
12. It's important for me to finish university because it assures me financially more stable future.		.848			-.123	
15. I'm studying because I think it will provide a better future for me.	.129	.772		.191	.218	
3. I like completing my obligations on time so I would have more time for personal amusement.		.553	.314	-.301		
10. Passing the exams is my only concern. Grades don't bother me at all.	-.122		-.839			
7. It would really bother me if I had lower grades then my colleagues.	-.133		.786			
16. I think that people who enroll on the university after high school have few more years for „enjoying life".	-.195			.793		
13. I believe that time being a student is the best and the most entertaining time in our lives.	.321	.173		.733	.151	
14. My friends would be very disappointed if I would quit the university.		-.100		.175	.728	
2. I prefer to study in groups, not by myself.		.179		-.113	.702	.101
17. I tend to pass all my exams in a given period of time because I financially couldn't handle to renrol the academic year.			.182		.216	.772
9. It's very important for me to keep my student's rights.		.182		.149	-.188	.732

Table 7. Rotated Component Matrix(a)

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
(a) Rotation converged in 5 iterations.

First component consists of three items; one of witch has negative loading on the factor. Students prone to this factor always knew that they want to enroll on the university; they didn't enroll on the university on their parents' persuasion and they like to learn new things and acquire new skills. This factor was named PERSONAL DESIRE and it is the only factor based entirely on intrinsic motivation aspects.

Second component also consists of three items. Students prone to this factor want to finish studying because they think it will assure them financially more stable future and better future is the main reason for their studying. They also like to complete their obligations on time so they would have more time for personal amusement. This factor was named FUTURE INSURANCE.
Third component consists of two items; one of witch has negative loading on the factor. Students prone to this factor wish to achieve high grades and they would be really bothered if they had lower grades than their colleagues. This factor was named GRADES.
Fourth component consists of two items. Students prone to this factor think that people who enroll on the university after high school have few more years for „enjoying life" and they believe that time being a student is the best and the most entertaining time in someone's live. This factor was named STUDY TO ENJOY.
Fifth component consists of two items. Students prone to this factor believe that their friends would be very disappointed if they would quit the university and they prefer to study for an exam in group. This factor was named FRIENDS.
The last, sixth factor also consists of two items. Students prone to this factor tend to pass all their exams in a given period of time because they financially couldn't handle to renrol the academic year and it is important for them to keep their student's rights. This factor was named SOCIAL MOTIVES.
We can conclude that there are six independent types of motivation for studying among our students: personal desire, future insurance, grades, study to enjoy, friends and social motives.
The extracted factors were tested for normality using the nonparametric one sample Kolmogorov-Smirnov tests which showed that all factors, except for the first one – personal desire ($p<.001$), are distributed according to normal distribution (p values ranging from .181 for study to enjoy to .947 for friends).
To test whether there is a connection between the type of motivation for studying and general attitudes towards Omega, bivariate correlation analyses were conducted. Statistically significant correlation was found only for the first factor ($rho=.334$; $p<.001$), so we can conclude that positive general attitudes towards Omega are stronger expressed in students with stronger personal desire for studying.
After conducting a sequence of t-tests with each factor as a dependent, and gender as an independent variable and after determining that the test results didn't show any statistically significant difference in means, we can conclude that male and female students do not differ in tendency to neither of extracted motives for studying. Similarly, no differences in means were determined on motives for studying in view of lower and higher study years, except for factor friends which is the preference for students from lower study years ($t=2.685$; $df=142$; $p=.008$).

6.2. Students' attitudes regarding the need for better integration of the Omega e-learning system into traditional teaching

For measuring students' attitudes regarding the need for better integration of the Omega e-learning system into traditional teaching we used five-point Likert scale with ordered response levels (1) Strongly disagree, (2) Disagree, (3) Neither agree nor disagree, (4) Agree and (5) Strongly agree. The scale was constructed out of six items presented in Table 8.

	(1)	(2)	(3)	(4)	(5)	$\overline{X}$	N

1. Omega should be used much more on our faculty than it is used now.	2.0%	4.1%	27.0%	38.5%	28.4%	3.87	148
2. It would be great if all courses were available on Omega.	2.7%	8.8%	30.4%	36.5%	21.6%	3.66	148
3. All teachers should be familiar with Omega's usage and options.	1.4%	1.4%	14.9%	42.6%	39.9%	4.18	148
4. All teachers should be using Omega.	2.0%	6.1%	30.4%	33.8%	27.7%	3.79	148
5. Omega should be used on all departments of our faculty.	1.4%	4.1%	21.8%	38.8%	34.0%	4.00	147
6. Teachers who use Omega are more organized than the ones who don't use Omega.	4.7%	12.2%	35.8%	27.7%	19.6%	3.45	148

Table 8. Students' attitudes regarding the need for better integration of Omega e-learning system into traditional teaching (distributions of percentages, means and numbers of valid answers)

As we can see, students generally agree with all statements supporting the idea of the need for better integration of the Omega e-learning system into traditional teaching (average scores range from 3.45 to 4.18). Generally, over 60% of students agree (4) or strongly agree (5) with given statements. Most students agree that all teachers should be introduced with Omega's usage and options (item 3) and that Omega should be used on all departments of their faculty (item 5).

To test the internal consistency reliability of this scale, Cronbach's alpha was computed and found to be .902, indicating very high reliability for this six items. The constructed scale was also tested for normality using the nonparametric one sample Kolmogorov-Smirnov test which showed that the scale is distributed according to normal distribution (p=.214).

To test the hypothesis about the connection of attitudes regarding the need for better integration of Omega e-learning system into traditional teaching with variables that constitute our independent context, we performed several analyses depending on the type of tested variables.

Independent-samples t-test showed statistically significant difference in attitudes regarding the need for better integration of the Omega e-learning system into traditional teaching in favor of male students ($t=2.922$; $df=145$; $p=.003$): on the scale with variations range from 6 to 30 points, male students have average of 24.8 while average of female students is 22.3 points – although both male and female have rather high average on this scale (that is, both have positive attitudes about this subject), there is somewhat higher positive preference of males.

We determined positive correlation of attitudes regarding the need for better integration of Omega e-learning system into traditional teaching with general attitudes towards Omega ($r=.696$; $p<.001$), the number of taken courses that were enrolled to Omega ($r=.376$; $p<.001$) and also with the use of ICT by their teachers ($r=.315$; $p<.001$). There is also a positive correlation with students' computer competence ($rho=.340$, $p<.001$), frequency of students' computer use in educational ($rho=.325$; $p<.001$) and private purposes ($rho=.250$; $p<.001$) and with students' satisfaction with their own computer competence ($rho=.292$; $p<.001$).

Finally, there is a positive correlation of attitudes regarding the need for better integration of Omega e-learning system into traditional teaching with friends as one of the types of motivation for studying (r=.172; p=.040).
In other words, the greater need for better integration of e-learning in traditional teaching is related with male students, with those students who have more positive general attitudes toward Omega and who had more opportunity to get acquainted with all benefits e-learning can produce. It is also associated with greater teachers' usage of ICT in educational purposes probably because teachers who are more competent in ICT use generally, have higher ability to use e-learning system in the way that students can profit the maximum from it. For the same reason, this need for integration is also more expressed in those students who have developed higher level of computer competence and who apply their knowledge and skills daily, whether in personal or educational purposes. Finally, students who believe that their friends would be very disappointed if they would quit the university and who prefer to study for an exam in group also tend to feel greater need for better integration of e-learning into traditional teaching.

6.3. Students' attitudes regarding better educational quality through the use of e-learning

The second issue considering students' attitudes regarding the use of Omega e-learning system referred to students' attitudes regarding better educational quality through the use of e-learning.
For measuring this concept five-point Likert scale was also used with ordered response levels (1) Strongly disagree, (2) Disagree, (3) Neither agree nor disagree, (4) Agree and (5) Strongly agree, and the scale was constructed out of six items14 presented in Table 9.

.	(1)	(2)	(3)	(4)	(5)	$\bar{X}$	N
1. If I miss some classes, it is easer for me to catch up with the class matter if the course is on Omega.	4.1%	8.9%	30.1%	31.5%	25.3%	3.65	146
2. Thanks to distribution of class materials via Omega, there is more time for engaging in discussions and dealing with the subject during lectures.	2.1%	15.1%	31.5%	34.2%	17.1%	3.49	146
3. Use of Omega exonerates lectures because it leaves more time to deal with class content.	2.7%	15.8%	33.6%	32.9%	15.1%	3.42	146
4. It is much more practical to download the class materials from Omega than to write down during lessons.	1.4%	8.2%	15.1%	40.4%	34.9%	3.99	146

14 Before the construction of Likert scale, item number 6 was recoded.

5. Use of Omega compels teachers to be more systematical which helps students greatly.	0.0%	4.1%	28.1%	42.5%	25.3%	3.89	146
6. If all courses were on Omega, students would be overburdened with commitments.	26.0%	24.7%	36.3%	8.2%	4.8%	2.41	146

Table 9. Students' attitudes regarding better educational quality through the use of Omega e-learning system (distributions of percentages, means and numbers of valid answers)

Students generally agree with all statements supporting the idea of better educational quality through the use of e-learning. Most students agree that it is much more practical to download the class materials from Omega than to write down during lessons (item 4) and that the use of Omega compels teachers to be more systematical which helps students greatly (item 5). Very small percentage of students agree that they would be overburdened with commitments if all courses were on Omega (item 6) which indicates that Omega is not seen as a burden, but as a helpful instrument for improvement of educational quality.

This constructed scale was also tested for normality using the nonparametric one sample Kolmogorov-Smirnov test which showed that this scale is also distributed according to normal distribution ($p=.419$).

We determined positive correlation of attitudes regarding better educational quality through the use of Omega e-learning system with general attitudes towards Omega ($r=.651$; $p<.001$), the number of taken courses that were enrolled to Omega ($r=0.337$; $p<0.001$), the usage of ICT by their teachers ($r=.297$; $p<.001$) and with satisfaction with Omega's options ($r=.199$; $p<.001$). There is also a positive correlation with frequency of students' computer use in educational purposes (rho=.264; $p=.001$) and with students' satisfaction with their own computer competence (rho=.195; $p=.018$).

In other words, positive attitudes about the possibilities of enhancement of educational quality using e-learning system is related (again) with those students who have more positive general attitudes about Omega and who had more opportunity to get acquainted with e-learning because they took more courses that were enrolled to Omega. It is also associated with more frequent teachers' usage of ICT in educational purposes and with greater satisfaction with Omega's options and characteristics. Also, students who use computer in educational purposes more frequently and those who are more satisfied with their own computer competences have more positive attitudes about this subject.

6.4. Students' attitudes regarding the quantity and the quality of Omega e-learning usage

Attitudes regarding the quantity of Omega e-learning usage were assessed on ordinal five-point scale from (1) Completely dissatisfied – Omega is not used enough to (5) Completely satisfied – Omega is used enough, and the attitudes regarding the quality were assessed also on ordinal five-point scale from (1) Completely dissatisfied – the quality of Omega usage is very low to (5) Completely satisfied – the quality of Omega usage is very high.

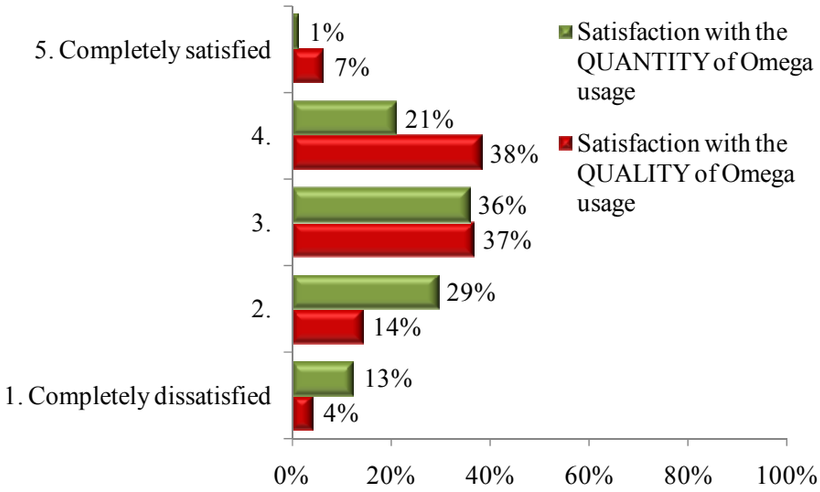

Fig. 10. Satisfaction with quantity and quality of Omega usage

As shown in Figure 10, the most frequent rank for quality of usage is rank 4 (38% of students) and for quantity rank 3 (36% of students).
The average score on assessment of quantity was 2.69, and on assessment of quality 3.28. Wilcoxon signed-rank test showed a statistically significant difference in these two assessments ($p<0.001$) so we can conclude that students are more satisfied with the quality than with the quantity of Omega usage. Over 40% of students think that Omega is not used enough (ranks 1 and 2) which also indicates a students' desire for greater integration of Omega in educational system.
To test the hypothesis about the connection of students' attitudes regarding the quantity and the quality of Omega e-learning usage with variables that constitute our independent context, we performed several analyses depending on the type of tested variables.

6.4.1. The quantity of Omega usage

Nonparametric Mann-Whitney U tests showed statistically significant difference in average ranking of satisfaction with the quantity of Omega usage in favor of male students ($p=.024$) and in favor of students from lower years of study ($p=.002$). Also, there is a positive correlation between satisfaction with the quantity of Omega usage and the number of taken courses that were enrolled to Omega ($rho=.563$; $p<.001$), the usage of ICT by their teachers ($r=.403$; $p<.001$) and satisfaction with Omega's options and characteristics ($r=.244$; $p=.005$). Out of all motivation factors, two are associated with attitudes regarding the quantity of Omega e-learning usage: factor personal desire negatively ($rho=-.178$; $p=.036$) and factor friends positively ($rho=.330$; $p<.001$).

6.4.2. The quality of Omega usage

Nonparametric Mann-Whitney U test showed statistically significant difference in average ranking of satisfaction with the quality of Omega usage in favor of students from lower years of study ($p=.021$). Higher satisfaction with the quality of Omega usage is positively correlated with the number of taken courses that were enrolled to Omega ($rho=.463$; $p<.001$),

the usage of ICT by their teachers (r=.426; p<.001), satisfaction with Omega's options and characteristics (r=.410; p<.001) and with better computer competence (rho=.221; p=.010).
In other words, greater satisfaction with both quantity and quality of Omega usage is connected with students from lower years of study, students who were taken a greater number of courses enrolled to Omega, with students whose teachers more frequently use ICT in educational purposes and with greater satisfaction with Omega's options and characteristics.
Greater satisfaction with the quantity of Omega usage is also connected with male students. In the context of motivation factors, students who tend to factor personal desire, that is those who always knew that they want to enroll on the university, who didn't do it on their parents' persuasion and who like to learn new things and acquire new skills, are less satisfied with the quantity of Omega usage, unlike students who tend to factor friends, that is those who believe that their friends would be very disappointed if they would quit the university and who prefer to study for an exam in groups, who are more satisfied with the quantity of Omega usage.
Greater satisfaction with the quality of Omega usage is also connected with students who have better computer competence.

7. Conclusion

The e-learning system integrated into traditional environment tends to remove, or at least, decrease barriers of the educational process, making it more flexible, enabling acquisition of new skills and competences, but also asking for adaptation, reorganization and investments in order to create better educational scenario. The research on quality measurement of the integrated e-learning system has shown the following:

1. Students generally agree with all statements supporting the idea of the need for better integration of the Omega e-learning system into traditional teaching. Most students agree that all teachers should be introduced with Omega's usage and options and that Omega should be used on all departments of their faculty.
2. The idea of better educational quality through the use of e-learning is generally supported by most of the students. They think that it is much more practical to download the class materials from Omega than to write down during lessons and that the use of Omega compels teachers to be more systematical which helps students greatly. Omega is not seen as a burden, but as a helpful instrument for improvement of educational quality.
3. Students are more satisfied with the quality than with the quantity of Omega usage. Over 40% of students think that Omega is not used enough which also indicates a students' desire for greater integration of Omega in educational system.
4. 45% of students are satisfied with the quality of Omega usage (ranks 4 and 5).

In our attempt to explain these attitudes with some concepts regarding students' experience, knowledge, competence and motivation, we came to conclusion that there are several concepts that are connected to all or some of the four aspects regarding students' attitudes towards the use of Omega e-learning system. These are: the number of taken courses that were enrolled to Omega, frequency of teachers' ICT use in educational purposes, satisfaction with Omega's options and characteristics, frequency of computer use in educational purposes, satisfaction with own computer competence and general attitudes towards

Omega. In addition, male gander and lower study years have also shown to be connected with some aspects of more positive attitudes towards the use of e-learning.
According to the reaction of students the e-learning systems have taken their position in formal and informal setting. Although seen in general with positive attitudes, it lacks social dimension. On the other side, development of new skills next to the sufficient motivation, and possibility of free access offer new role in blended learning.

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E-learning Experiences and Future

Edited by Safeeullah Soomro

ISBN 978-953-307-092-6
Hard cover, 452 pages
Publisher InTech
Published online 01, April, 2010
Published in print edition April, 2010

This book is consisting of 24 chapters which are focusing on the basic and applied research regarding e-learning systems. Authors made efforts to provide theoretical as well as practical approaches to solve open problems through their elite research work. This book increases knowledge in the following topics such as e-learning, e-Government, Data mining in e-learning based systems, LMS systems, security in e-learning based systems, surveys regarding teachers to use e-learning systems, analysis of intelligent agents using e-learning, assessment methods for e-learning and barriers to use of effective e-learning systems in education. Basically this book is an open platform for creative discussion for future e-learning based systems which are essential to understand for the students, researchers, academic personals and industry related people to enhance their capabilities to capture new ideas and provides valuable solution to an international community.

How to reference

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Ksenija Klasnic, Jadranka Lasic-Lazic and Sanja Seljan (2010). Quality Metrics of an Integrated E-learning System – Students' Perspective, E-learning Experiences and Future, Safeeullah Soomro (Ed.), ISBN: 978-953-307-092-6, InTech, Available from: http://www.intechopen.com/books/e-learning-experiences-and-future/quality-metrics-of-an-integrated-e-learning-system-students-perspective

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51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
www.intechopen.com

InTech China
Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

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